CHIROPTERAN NOTES

By Knud Andersen

The bats described or commented upon in this paper were sent to me for inspection or identification by Marquis Giacomo Doria, Director of the Genoa Civic Museum, during the latter half of the year 1906. Duplicates of some of the forms have kindly been ceded by Marquis Doria to the British Museum.

The principal points of interest to specialists may be these:

a species of *Mormopterus (M. doriae)* from Sumatra, belonging to a section of the genus hitherto known from the Malagasy region and Southeast Africa only (p. 42);

a second specimen of *Chaerephon johorensis*, showing the range of the species to extend to Sumatra (p. 39);

a second and third specimen of *Hipposiderus schneideri* from Sumatra (p. 21);

a hitherto undescribed species of *Myotis* from the Andamans *(M. dryas)*, apparently allied to *M. adversus* (p. 37);

Hipposiderus lankadiva, hitherto known from Ceylon only, now recorded from Burma (p. 9);

Engano individuals of *Hipposiderus diadema*, constituting a separate race *(H. d. enganus)* with closer affinities to the continental than to the Sumatran race (p. 8);

examples of *Hipposiderus diadema* from Tenasserim and the Malay Peninsula apparently referable to Dobson's « *Phyllorhina masoni* » (p. 6);

examples of *Hipposiderus caffer* referable to Cabrera's recently described « *H. tephrus* », showing this form to be of wide distribution in Africa north of the Congo Basin (p. 12);

examples of *Hipposiderus caffer* from San Thomé and Prince's Island, Gulf of Guinea, showing the race inhabiting these outlying islands to be the same as the continental *H. c. guineensis* (p. 17);

Rhinolophus macrotis, hitherto known from the Himalayas only, now obtained in Sumatra, the individuals, however, differing slightly so as to constitute a distinct race, *Rh. m. dohrni* (p. 29);

a distinct race of *Rhinolophus euryotis* from the Aru Islands *(Rh. e. aruensis)*, markedly different from that of the neighbouring Key Islands (p. 33);

Rhinolophus stheno and *refulgens,* hitherto known from the Malay Peninsula only, now obtained in Sumatra (pp. 24, 26);

Rhinolophus truncatus, hitherto known from Batchian only, now recorded from Ternate (p. 23).

Six of the forms dealt with in this paper were collected by Dr. H. Dohrn in Sumatra. Of these two were new: *Mormopterus doriae* and *Hipposiderus macrotis dohrni;* three were known from the Malay Peninsula, but not from Sumatra: *Chaerephon johorensis, Rhinolophus stheno, Rhinolophus refulgens;* two were hitherto known from the single type specimens only, respectively in the Calcutta Museum and the British Museum: *Chaerephon johorensis, Hipposiderus schneideri.*

An « Index of the technical names » of all the forms mentioned in these Notes is found on pp. 44, 45.

1. **Hipposiderus diadema masoni,** Dobs.

1872. *Phyllorhina Masoni,* Dobson, Journ. As. Soc. Bengal XLI. pt. II. p. 338. — Type locality: Moulmein, N. Tenasserim.

1876. *Phyllorhina diadema,* subsp. α, *masoni,* Dobson, Monogr. As. Chir. pp. 62, 202-3. — Brief description, and text-figure of head in front view.

1878. *Phyllorhina diadema* var. α?, Dobson, Cat. Chir. Brit. Mus. p. 138.

1905. Dobson's « *Ph. masoni* »; Knud Andersen, Ann. & Mag. N. H. (7) XVI. p. 500, footnote (1 Nov. 1905). — Remarks on the second specimen (« b ») recorded below.

a. ♀ ad. (in alc.). Meetan, Valley of the river Houn-daraw, Tenasserim: April 1887. Collected by Sr. Leonardo Fea. Genoa Museum.

b. Ad. (skin). Gunnong Pulai, Johore, Malay Peninsula; 7 March 1880. Collected by W. Davison; presented by A. O. Hume. British Museum (no. 85.8.1.114).

The two *H. diadema* here referred to Dobson's « *Phyllorhina masoni* » may be briefly characterised as follows: —

Skull large and heavily built; facial portion very broad: an-

teorbital width 9.8-10 mm.; teeth large: maxillary row about 13 mm. External dimensions large: forearm 86.8-90.5 mm., third metacarpal 64.7-65.2 mm.

H. d. masoni comes very near to *H. d. diadema* from Java and Timor, from which it differs only in the rather heavier skull, broader face and larger nose-leaves. The two races can only be discriminated by *average* characters.

My reasons for identifying this peninsular race of *H. diadema* with « *Ph. masoni* » — hitherto known from a single specimen, obtained at Moulmein, Tenasserim, and preserved in the Calcutta Museum — are these: — According to Dobson, who at first (1872) regarded *Ph. masoni* as a quite distinct species, it differs from *H. diadema* in two respects: — « The concave front surface of the base of the transverse nose-leaf is divided into two cells only by a single central longitudinal fold »; and « from the under surface of the symphisis of the mandible a small conical bony process projects downwards, about equal to the lower canine tooth in vertical extent ». Later on (1876) Dobson put *Ph. masoni* down as a subspecies of *Ph. diadema;* and finally, in 1878, he was evidently inclined to consider it an *individual* variety only.

Dobson was probably right in regarding the two characters on which he originally based *Ph. masoni* as individual aberrations. In *H. diadema* there are generally three vertical ridges on the front face of the posterior leaf, but the two lateral ridges are always less prominent than the central ridge, and in some specimens (irrespective of racial differences) they are so much reduced as to be rather indistinct; the type of *Ph. masoni* is probably an individual of this kind. As to the downwards projecting bony process from the symphysis of the mandible, I think there can be no doubt that this is a mere individual deformity. But when leaving these two « characters » out of consideration, the whole original description of *Ph. masoni* is reduced to the following three facts: it is a bat of the *H. diadema* type, of large size (forearm, according to Dobson, 85 mm.), and inhabiting Tenasserim and neighbourhood; in other words: it is the peninsular race of *H. diadema.*

The example obtained by Leonardo Fea is practically a topotype of *Ph. masoni,* Meetan being situated close east of Moulmein.

Some measurements of the two specimens of *H. d. masoni* are given on p. 9.

2. **Hipposiderus diadema enganus,** subsp. n.

1894. *Hipposiderus diadema* Geoff., Thomas, Ann. Mus. Civ. Genova (2) XIV. p. 108 (10 April 1894). — Kifa-juc, Engano: record of the first (« a ») of the specimens mentioned below.

a. ♀ ad. (in alc.). Kifa-juc., Engano; 1891. Collected by Dr. E. Modigliani. Presented to the British Museum by Marquis G. Doria (no. 6.12.1.2). Type of the subspecies.

b. ♂ ad. (in alc.). Bua-Bua, Engano; 1891. Collector and Donor as above (B. M. no. 6.12.1.1).

Similar to *H. d. masoni,* but with rather larger ears, broader horse-shoe, longer tibia, very broad facial portion of the skull, and very large teeth.

The skull of *H. d. enganus* is quite of the ordinary *diadema* shape; in size it comes nearest to the skulls of *H. d. masoni* and *H. d. diadema.* The facial portion is as broad as, or if anything still broader than, in *masoni;* in this respect *H. d. enganus* approaches *H. euotis.* In all other races of *H. diadema* known to me the length of the maxillary tooth-row is from 11.3-13.2 mm.; in the two examples of *H. d. enganus* it measures 13.3-14.2 mm. — The ears are slightly larger than in any other race: width 28.3-28.8 mm., as against 24.2-27.5 in all other forms taken together; also in this respect *H. d. enganus* approaches *H. euotis.* The width of the horse-shoe, in all other races, is 9-11.2 mm.; in *H. d. enganus* 11.8-12.2 mm. The lower leg, in seven *H. d. diadema* and *masoni,* measures 34.3-35.8 mm.; in two *H. d. enganus* 36.5-38 mm. The general size (forearm 88.8 and 92 mm.) is as in *H. d. diadema* and *masoni,* if not larger. — In one of the two specimens examined there is a minute fourth lateral leaflet, externally to the third; a similar indication of a fourth leaflet I have seen occasionally in *H. d. vicarius.*

H. d. enganus is a well marked local form of *H. diadema,* so well marked that already a first glance on it (the large nose-leaves, large ears, large general size) gave me the impression that it was rather different from any of the races described in my paper on *H. diadema;* but it cannot be separated as a distinct

species; there is absolutely no structural difference betwen *H. d. enganus* and the other races; all the points enumerated above indicate only differences *of degree*, and I have no doubt that in a large series of the Engano form individuals will be found which are pratically indistinguishable from *H. d. masoni* and *diadema*.

It is worth noticing that *the Engano race of H. diadema is in every respect nearer to the peninsular (d. masoni) and Java-Timor race (d. diadema) than to the Sumatran form*, which latter is indistinguishable from the Bornean form (*d. vicarius*).

Measurements of *Hipposiderus diadema masoni* and *enganus*.

	H. d. masoni.		*H. d. enganus.*	
	Tenasserim. ♀ ad.	Malay Pen. Ad.	Engano. ♂ ad.	Engano. Type. ♀ ad.
	mm.	mm.	mm.	mm.
Skull, total length to front of c.	32.7	33.3		34
» basilar length to front of c.	26.8			27.2
» mastoid width	15.3			
» width of brain-case	12.8	13		12.8
» zygomatic width	18.8	19.8		
» maxillary width	12.3	13.2		12.5
» anteorbital width	9.8	10		10.2
» across cingula of canines	8.7	8.8		8.8
Mandible, to front of incisors	23.5	23.9	25.7	24
Upper teeth, c-m^3	13.1	13	14.2	13.3
Lower teeth, c-m_3	14.1	14.3	15.8	14.8
Ears, length, inner margin	28.5		30	30.2
» greatest breadth	26.2		28.3	28.8
Horse-shoe, greatest breadth	11		12.2	11.8
Posterior leaf, breadth	13		12.2	12.2
Forearm	90.5	86.8	92.7	88.8
Pollex	13.5		15	15.5
3rd digit, metacarpal	65.2	64.7	64.2	62
— 1st phalanx	32	28.2	29.5	29
— 2nd phalanx	32	28.6	32.5	32.2
4th digit, metacarpal	62.5	60.5	63.8	60
— 1st phalanx	23.3	20.9	21	21.2
— 2nd phalanx	17.8	14.9	16.2	16.2
5th digit, metacarpal	56.2	54.8	58.2	55
— 1st phalanx	23.2	21.8	22.2	21
— 2nd phalanx	18.5	15.8	18.8	18.2
Tail	57.5		53	53
Lower leg	34.5	34.3	38	36.5
Foot, with claws	18.3		18.5	18.5

3. **Hipposiderus lankadiva**, Kelaart.

1852. *Hipposiderus lankadiva*, Kelaart, Prodromus Faunae Zeylanicae, p. 19. — Type locality: Kandy, Ceylon.

1878. *Phyllorhina diadema* (partim, not Geoff.), Dobson, Cat. Chir. Brit. Mus. p. 137. — Ceylon specimens only.

1892. *Hipposiderus diadema* (not Geoff.), Thomas, Ann. Mus. Civ. Genova (2) X. p. 924. — Bhamó, Upper Burma (one of the specimens mentioned below).

1905. *Hipposiderus lankadiva* Kel., Knud Andersen, Ann. & Mag. N. H. (7) XVI. pp. 500-502, 507 (1 Nov. 1905). — *H. lankadiva* shown to be different from *H. diadema*.

a. b. ♀ imm., ♀ jun. (in alc.). Bhamó, Upper Burma. Collected by Sr. Leonardo Fea (1885 and 1886). Genoa Museum. — Skulls of both specimens extracted.

H. lankadiva is easily distinguished from *H. diadema* (with which it has till recently been confused) by the following four characters: —

The upper aspect of the facial portion of the skull directly in front of the sagittal crest (i. e. the region bordered behind by the front of the sagittal crest and externally by the supraorbital ridges) is distinctly convex or flattened, not concave as in *diadema*. The mesopterygoid space is narrower, the palation angle acute or subacute; in *diadema* the mesopterygoid space is broader, the palation angle broadly rounded off. The upper border of the posterior nose-leaf is trilobate, i. e. there is a median globular projection, separated on either side by a very distinct emargination from the convex-margined lateral parts of the leaf; in *diadema* the upper border of this leaf is almost evenly convex, as a segment of the circumference of a circle. Of the three vertical ridges on the front face of the posterior leaf, the lateral ones are quite as strong as (or, if anything, stronger than) the median one; in *diadema* the lateral ridges are always considerably less prominent than the median ridge, sometimes so much reduced as to be almost obliterated; this difference in the development of the ridges is probably a consequence of the difference just mentioned in the shape of the posterior leaf. — In addition to these points, the cranial rostrum of *H. lankadiva* is comparatively narrower, and the ears comparatively smaller than in *H. diadema*.

The above characterization is based on an examination of 7 *H. lankadiva* (6 skulls) and 32 *H. diadema* (24 skulls).

The species was hitherto known from Ceylon only (see my paper, l. s. c., p. 501). It is therefore of much interest now to find its range extended as far as Burma. Unfortunately the only two examples obtained by Leonardo Fea in this latter place are

immature; they accord, in all essential respects (cranially and externally), with *H. lankadiva* from Ceylon, above all, of course, in the four characters just pointed out, but whether there are minor differences which would make it necessary to separate the Burmese bat as a distinct race, I am unable to decide with certainty from these two youngish specimens.

Tenasserim is the most western locality from which I have seen any specimen of *H. diadema*, the species ranging, as far as known to me, in various races from Tenasserim and the Malay Peninsula *(H. d. masoni)* in the west, eastwards through the Indo-and Austro-Malayan Archipelago (*H. d. enganus, diadema, vicarius, griseus*), as far as New Guinea *(H. d. pullatus)* and the Solomon Islands *(H. d. oceanitis)*. But Dobson has recorded « *H. diadema* » from the Central Provinces of India, and he also mentions a specimen from Darjeeling (1). But, considering that *H. lankadiva* was by Dobson (as by others) confused with *H. diadema;* further, that *H. lankadiva* is now known to occur not only in Ceylon but also in Burma, and therefore, no doubt, also inhabits the Indian Peninsula and parts of Himalaya, the question arises: are the specimens recorded by Dobson really *H. diadema*, or are they *H. lankadiva?* Is it perhaps that *H. lankadiva* is a western species, ranging from Ceylon and the Indian Peninsula to Burma, *H. diadema* an eastern species, ranging from Tenasserim and the Malay Peninsula to the Solomon Islands? Since the two species are evidently rather closely related, of nearly the same size, and probably have much the same habits (food, &c.), the suggestion is, a priori, not unreasonable that they occupy separate areas, allowing, of course, for the probability that these areas overlap each other somewhere in Indo-China. — A re-examination of the specimens in the Calcutta Museum registered by Dobson would give some basis for a settling of these questions.

4. **Hipposiderus caffer caffer,** Sund.

1847. *Rhinolophus caffer*, Sundevall, Öfv. Kgl. Vet.-Akad. Förh. III. no. 5 (13 May 1846), pp. 118-119. — Type locality: Port Natal. (Paratype examined.)

(1) Mon. Asiat. Chir. p. 200, nos. 292-296 (1876); see also J. Anderson, Cat. Mamm. Ind. Mus. Calcutta, p. 115 (1881).

1852. *Phyllorhina gracilis*, Peters, Naturw. Reise nach Mossambique. Säugeth., pp. 36-38; pl. VII. figs. 1-4; pl. XIII. figs. 14-15. — Type locality: Tete, Lower Zambesi.

1861. *Phyllorhina bicornis*, Heuglin, N. Acta Acad. Caes. Leop.-Car. XXIX. pp. 4, 7-8. — Type locality: Keren, Erythrea. (Types examined.)

1906. *Hipposiderus caffer*, Sund., *typicus*, Knud Andersen, Ann. & Mag. N. H. (7) XVII. pp. 275-77, 281-82 (1 March 1906).

a. ♂ ad. (in alc.). Monkullo, near Massaua, Erythrea. Collected and presented by Dr. G. Schweinfurth. Genoa Museum. — Skull extracted.

b. ♀ ad. (in alc.). Ghinda, Erythrea; July 1893. Collected by Dr. V. Ragazzi. Genoa Museum.

c.-d. ♂ ad., ♂ ad. (in alc.). Agordat, Erythrea; June 1906. Collected by Dr. C. Figini. Presented to the British Museum by Marquis G. Doria (nos. 6.12.1.3-4). — One skull extracted.

e. ♀ ad. (in alc.). Harrar, Gallaland; May-June 1904. Collected by Capt. C. Citerni. Genoa Museum. — Skull extracted.

These five specimens from Erythrea and Gallaland accord in every respect with the large series of *H. caffer caffer* in the British Museum; and the region in which they were obtained falls quite within the limits of the area inhabited by this race, as defined in my paper on *H. caffer* (l. s. c.).

5. **Hipposiderus caffer tephrus**, Cabr.

1906. *Hipposiderus tephrus*, A. Cabrera Latorre, Bol. R. Soc. españ. Hist. nat. pp. 358-59 (July 1906). — Type locality: Mogador, Morocco. (Topotype examined.)

a-b. ♂ ad., ♂ ad. (in alc.). Nubia. From E. Verreaux. Genoa Museum. — Skulls of both extracted. Teeth unworn.

c-d. ♀ ad., ♀ ad. (in alc.). Ashantee. From E. Verreaux. Genoa Museum. — One skull extracted. Teeth unworn.

e-f. ♂ ad., ♀ ad. (in alc.). Gold Coast. From Dr. Jentink [presumably from Pel's collections]. Genoa Museum. — One skull extracted. Teeth unworn.

g-k. 5 ♀ ad. (in alc.). Farim, Portuguese Senegambia; May 1899. Collected by Sr. Leonardo Fea. Genoa Museum. One specimen presented to the British Museum by Marquis G. Doria (no. 6.12.1.5). — Three skulls extracted. Teeth unworn or slightly worn.

l. ♀ young ad. (in alc.). Mogador, Morocco; 29 August 1905. Collected by Sr. Martinez de la Escalera. Received in exchange from A. Cabrera Latorre. Topotype and paratype of *H. tephrus*, Cabr. (specimen « b » in Cabrera's paper, l. s. c. p. 358). British Museum (no. 6.12.1.6). — Skull extracted.

According to Cabrera, *H. tephrus* differs from *H. caffer* in the following three respects: —

(1) It is « más pequeño que cualquiera de las formas de esta especie hasta ahora descritas »; forearm 46, third metacarpal 31 mm. (2) The ears are « más largas que anchas », whereas « en las otras dos especies del mismo grupo (*H. caffer* y *beatus*), la longitud de las orejas es menor que su anchura »; length of ear 13.5, width of ear 12.5 mm. (3) The skull « es notable por ofrecer una anchura maxilar menor que la longitud de la serie dental superior, mientras en el *H. caffer* dicha anchura es igual ó un poco mayor que la longitud de la serie dental »; in the type specimen the maxillary width is stated to be 5 mm., the maxillary tooth-row 5.7; in another specimen the measurements are stated to be, respectively, 5 and 6 mm.

In testing the validity of these characters I leave out of consideration all the other examples referred by me above to *H. c. tephrus*, taking as a basis only the authentic specimen (topotype and paratype) sent by Cabrera: —

The length of the ears of this specimen, from base of inner margin to tip, is 13 mm., their greatest width 14.2 mm., i. e. *the ratio between the length and width of the ears is quite as in all other races of H. caffer.* It will be noticed that my measurements of the length of the ear (13 mm.) is very closely in accordance with that given by Cabrera (13.5 mm.), whereas there is a considerable difference between his (12.5 mm.) and my own measurement (14.2 mm.) of the *width* of the ear; when therefore Cabrera found the ear of *H. tephrus* to be much narrower than indicated by me for any race of *H. caffer*, it is obviously because he took the measurement according to a method different from my own. — In all the four races of *H. caffer* described in my monograph of this species, the maxillary width of the skull (externally, across m^3-m^3) is a trifle larger than, or at least equal to, the length of the maxillary tooth-row (c-m^3), in *H. tephrus* the former is stated to be decidedly smaller than the latter; in other words, the palate is said to be narrower. But the maxillary width of the topotype of *H. tephrus* is 6.3 mm., the maxillary tooth-row 6 mm., i. e. *the ratio between the maxillary width and the length of the maxillary tooth-row is quite as in all other races of H. caffer.* Here, again, it will

be noticed that Cabrera's measurement of the tooth-row (5.7 mm.) is practically the same as that taken by myself (6 mm.), whereas the difference lies in his (5 mm.) and my own measurement (6.3 mm.) of the maxillary width; that is, the alleged difference, in this respect, between *H. tephrus* and *H. caffer* is entirely due to a difference in the method of measuring. — There remains the difference in general size between *H. tephrus* and *H. caffer caffer,* emphasised by Cabrera. This holds good to a certain extent, i. e. the former *averages* slightly smaller than the latter. — I have carefully compared the Morocco specimen with the British Museum series of *H. c. caffer*, and can find absolutely nothing beyond this small average difference in dimensions; it is therefore out of the question to consider *H. tephrus* a distinct species, but it may be kept separate as a local race.

Having thus discussed the general characters of *H. c. tephrus* I can now proceed to point them out in detail: — *H. c. tephrus* is extremely close to *H. c. caffer*, but has — (1) smaller ears: length of ear-conch from base of inner margin, in 12 specimens, 11-13.5 mm. (in 45 *H. c. caffer* 12.5-15 mm.); width of ears 13-14.8 mm. (in 45 *H. c. caffer* 14-16.5 mm.); — (2) shorter forearm: 44.5-47 mm. (46.5-51.8 mm.); — (3) shorter metacarpals: third metacarpal 31.8-33.8 mm. (33.5-38.2 mm.); — (4) shorter tail: 26.5-32 mm. (30-38 mm.); — (5) shorter lower leg: 18.2-20 mm. (19.3-22 mm.); — (6) smaller skull: total length of 8 skulls, to front of canines, 16.7-17.2 mm. (in 32 *H. c. caffer* 17.2-18.3 mm.): length of mandible 10.3-10.8 mm. (10.7-11.5 mm.); but notwithstanding the smaller skull the size of the teeth seems to be the same as in *H. c. caffer:* length of maxillary tooth-row 5.7-6 mm. (5.7-6.2 mm.); this latter fact has already been mentioned by Cabrera (« los dientes, con relación al tamaño del cráneo, son bastante grandes »). — Further particulars are found in the table below (p. 16), in which I give measurements of the specimens examined of *H. c. tephrus* from (a) Nubia, (b) Ashantee and Gold Coast, (c) Farim, and (d) Mogador; further, (e) minimum and maximum of all the specimens taken together, and, for comparison, (f) minimum and maximum of a large series of *H. c. caffer*.

The colour of the fur, in *H. c. tephrus*, is precisely as in *H. c. caffer*.

H. c. tephrus is not confined to Morocco, nor even to N. W. Africa. As seen by the list of specimens referred by me above to this race, it also occurs in Nubia, Ashantee, the Gold Coast, and Portuguese Senegambia. This series of places gives, probably, a fairly good idea of its true range, and it, at the same time, enables us to understand its origin and its present distribution. In discussing these questions, the following should be borne in mind: — First, *H. c. tephrus* is extremely closely related to the East African *H. c. caffer*, so closely, indeed, that there can be no reasonable doubt that it is nothing but a northwestern offshoot of this latter; second, if this is taken as granted, it can only have reached Portuguese Senegambia and Western Morocco in one of two ways: either from Kordofan (the most northern point known of the range of *H. c. caffer*) through the Nile Valley, along the Mediterranean coast of Africa, to Morocco, down the Atlantic coast to Senegambia and the Gold Coast; this route, in itself highly improbable, is made practically unthinkable owing to the fact that *H. caffer* is completely unknown in Egypt as well as in the whole Mediterranean coast region of Africa; thus only a second way is left: from Kordofan *H. c. caffer* has spread northwards as far as Nubia, westwards through Bahr el Gazal, the Tsad Sea Region and the Upper Niger Valley, to Ashantee and the Gold Coast, further to Senegambia and northwards to Morocco. By this explanation it is at once made clear, why there in the western (Senegambia) and northwestern corner (Morocco) of Africa occurs a race, *H. c. tephrus*, which has nothing to do with the geographically nearer *H. c. guineensis* or *H. c. centralis*, but, on the contrary, is phylogenetically extremely closely connected with the East African *H. c. caffer;* and it is also clear, why there in the Guinean coast region (Ashantee, Gold Coast) occur two races of this species, *H. c. tephrus* and *guineensis* which phylogenetically as well as in general appearance are the strongest contrasts to each other: the former, namely, has come from east, through the Niger Valley, the latter from the centre of Africa, the Congo Valley.

Measurements of *Hipposiderus caffer tephrus*.

	H. c. tephrus.									*H. c. caffer.*	
	Nubia. 2 adults, 2 skulls.		Ashantee, Gold Coast. 4 adults, 2 skulls.		Farim. 5 adults, 3 skulls.		Mogador. ♀ y. ad. Paratype.	All localities. 12 adults, 8 skulls.		All localities. 45 adults, 32 skulls.	
	Min.	Max.	Min.	Max.	Min.	Max.		Min.	Max.	Min.	Max.
	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.
Skull, total length to front of c.	16.7	17		16.9	16.8	17.2	17	16.7	17.2	17.2	18.3
» basilar length to front of c.	12.8	13		12.9	12.7	13	13	12.7	13	13.1	14
» mastoid width	9	9.2		9.1	9.2	9.2	9.4	9	9.4	9.1	9.8
» width of brain-case	7.8	8.2	7.8	8	7.8	7.9	8.2	7.8	8.2	7.9	8.3
» zygomatic width.	8.9	9.2	9.2	9.2	8.9	9	9.2	8.9	9.2	9	9.8
» maxillary width.	5.8	6	5.8	6.1	6	6.1	6.3	5.8	6.3	6	6.3
» anteorbital width	4.4	4.7	4.5	4.5	4.4	4.7	4.7	4.4	4.7	4.5	4.9
» across cingula of canines	3.9	4.2	3.8	3.9	4	4.2	3.8	3.8	4.2	3.9	4.3
Mandible, to front of incisors	10.6	10.8	10.6	10.7	10.3	10.8		10.3	10.8	10.7	11.5
Upper teeth, c-m^3	5.8	5.8	5.7	5.8	5.8	6	6	5.7	6	5.7	6.2
Lower teeth, c-m_3	6	6.2	6	6.2	6.2	6.2	6.5	6	6.5	6.2	6.8
Ears, length, inner margin	11.7	12	11	11.5	12	13.5	13	11	13.5	12.5	15
» greatest breadth.	13.8	14	13	13.5	14	14.8	14.2	13	14.8	14	16.5
Horseshoe, greatest breadth.	5.8	5.8	5.7	6	5.2	6	5.5	5.2	6	4.8	6.4
Posterior leaf, breadth.	6	6.8	6.2	6.8	6	6.3	6	6	6.8	6	6.8
Forearm	44.5	45.8	45.8	47	45	46.8	46.2	44.5	47	46.5	51.8
Pollex.	6.5	6.7	6.5	7	7	7.5	6.9	6.5	7.5	7.2	8.7
3rd digit, metacarpal	31.8	33.8	31.8	33	32	33.7	32	31.8	33.8	33.5	38.2
— 1st phalanx.	14	14.3	14	15	14	15	13.8	13.8	15	14.2	16.8
— 2nd phalanx	16	16	15.8	17.3	14.2	16	14.8	14.2	17.3	15	18.8
4th digit, metacarpal	32	33.8	32.2	33.5	32	33.5	31.8	31.8	33.8	33	38.8
— 1st phalanx	9.8	10	10	10.3	9.5	10	10	9.5	10.3	9.3	11.2
— 2nd phalanx	8.2	8.7	8.2	8.7	8.7	9	8	8	9	8	10.2
5th digit, metacarpal	28.7	30.2	28	29.7	28	29	28.2	28	30.2	29	34
— 1st phalanx	12	12.2	11.8	12.8	12	12.5	12.5	11.8	12.8	12	14
— 2nd phalanx	9.2	9.5	9.2	9.8	9.5	10.5	9.5	9.2	10.5	9.2	11.5
Tail	28.2	31	26.5	31	28	32	27	26.5	32	30	38
Lower leg	19.8	19.8	19	19.7	19.2	20	18.2	18.2	20	19.3	22
Foot. with claws	7.8	8	8	9	8	9	8	7.8	9	8	9.4

6. **Hipposiderus caffer centralis**, K. And.

1906. *Hipposiderus caffer centralis*, Knud Andersen, Ann. & Mag. N. H. (7) XVII. pp. 277-78, 281-82 (1 March 1906).

a. ♀ ad. (in alc.). Vivi, Lower Congo; Febr. 1886. Collected by Capt. G. Bove. Genoa Museum. — Skull extracted.

The Congo Valley is the true home of the large-skulled and large-toothed race recently separated by me under the name *H. c. centralis*. The specimen from Vivi is quite in accordance with the characters given in the paper referred to above.

7. **Hipposiderus caffer guineensis**, K. And.

1906. *Hipposiderus caffer guineensis*, Knud Andersen, Ann. & Mag. N. H. (7) XVII. pp. 278-79, 282 (1 March 1906).

a–c. ♂ ad., ♀ ad., ♀ young ad. (in alc.). Island of San Thomé, Gulf of Guinea, 0–300 m.; July-August 1900, and June 1901. Collected by Sr. Leonardo Fea. Genoa Museum. One specimen presented to the British Museum by Marquis G. Doria (no. 6.12.1.9). — Two skulls examined. All the specimens have the teeth unworn.

d–o. 2 ♂ ad., 2 ♂ young ad., 1 ♀ ad., 5 ♀ young ad., 2 ♀ juv. (in alc.). Prince's Island, Gulf of Guinea, 100–300 m.; January-March, and May, 1901. Collected by Sr. Leonardo Fea. Genoa Museum. Two specimens presented to the British Museum by Marquis G. Doria (nos. 6.12.1.7-8). — Three skulls examined. All the specimens have the teeth unworn.

p–q. 2 ♀ ad. (in alc.). Liberia. Received from Sr. P. Siepi. Genoa Museum. — One skull examined. Teeth almost unworn.

The fine series collected by the late Sr. Leonardo Fea enables me to say that individuals of *H. caffer* from San Thomé and Prince's Island are indistinguishable from the race (*H. c. guineensis*) distributed over Fernando Po and the adjoining Guinean coast region, from the Como River to Liberia. Also the coloration of the fur is the same as in Fernando Po and continental specimens (see my paper, l. s. c.).

In the table below (p. 20) I give measurements of Fea's adult specimens from (1) San Thomé and (2) Prince's Island, and, for comparison, those of a British Museum series from (3) Fernando Po, and of all adult specimens of this race I have seen from (4) the Guinean Coast (Como River, Gaboon, Benito River, Cameroons, Old Calabar, Liberia).

The races of H. caffer, their interrelations and distribution. — There are five geographical races of *H. caffer: caffer, tephrus, centralis, guineensis, angolensis.* They fall into two natural groups, as follows: —

(1) A small-toothed, small-skulled, narrow-jawed, and light-coloured form, *H. c. caffer*, inhabits the eastern part of the continent, from Erythrea and Kordofan in the north, to Transvaal and Pondoland in the south. From the southern part of this area, no doubt through the Zambesi Valley, it has made its way to Angola. From the northern part of its area it has spread northwards to Nubia, westwards through Bahr el Gazal, the Tsad Sea region and Niger Valley, to Ashantee and the Gold Coast, further to Senegambia and Western Morocco; but in all of these places it has slightly diminished in size, thus constituting a fairly distinct race, *H. c. tephrus.*

(2) A large-toothed, large-skulled, broad-jawed, and darker-coloured form, *H. c. centralis,* occupies the broad Equatorial belt of the continent, from the Congo estuary in the west, through the whole of the Congo Valley, to Uganda. From this region it has spread in three directions: — eastwards, to British and German East Africa, where it meets and occurs together with *H. c. caffer;* southwestwards, along the Congo tributaries, to Angola, where it again meets *H. c. caffer;* and northwestwards, along the Guinean coast, including the islands in the Gulf of Guinea; but individuals from this latter tract (Guinean coast and islands) reach the extreme in the width of the upper jaw and the darkness of the colour of the fur, and may be kept distinct as a fairly recognizable race, *H. c. guineensis.* In the Guinean coast region this large-skulled and dark extreme meets and occurs together with its strongest contrast, the very small-skulled and light-coloured *H. c. tephrus.*

From this it will be observed that there are, in fact, two principal forms only of *H. caffer:* the one (*H. c. centralis* +

guineensis) occupying the Congo Valley, from which it has spread eastwards, southwestwards, and northwestwards; the other (*H. c. caffer* + *tephrus*) occupying the rest of Africa, the extreme south and the Mediterranean coast region excepted. This being so, it might be questioned, whether it would not be better, from a technical point of view, to treat these two principal forms as distinct « species », viz. *H. caffer* (subdivided into *H. caffer caffer* and *H. caffer tephrus*) and *H. centralis* (subdivided into *H. centralis centralis* and *H. centralis guineensis*); it would have the obvious advantage of expressing, by the very technical names, the true phylogeny of the races, whereas, when we put all the races down as « subspecies » of *H. caffer*, our nomenclature *obscures* their phylogenetic interrelations, in so far as then the technical names of the four races easily convey the idea that they are of equal « value » (i. e. equally distinct from each other), which certainly they are not. But to base nomenclature on phylogenetic considerations would, in my opinion, be a rather dangerous principle; and in this particular case there are at least two reasons which make it unadvisable to treat *H. c. caffer* and *centralis* as distinct species: — first, though they, even where their areas overlap each other and where, consequently, they would seem to have good opportunity for intergradation, almost always preserve their racial characters clear and well pronounced, intermediate examples do occur, though apparently very rarely (in a large number of individuals, from many different places in East Africa, I have found one only which is intermediate between *caffer* and *centralis*); second, in Angola, where *caffer*, having come from east (the Zambesi valley), and *centralis*, having come from northeast (the Congo valley), live together, there also occurs a truly intermediate « race », *H. c. angolensis*. These facts are strong evidence that *caffer* and *centralis* are not sufficiently sharply differentiated to be considered distinct *species*. — As being intermediate, the Angolese « race » hardly deserves a technical name of its own, but since the name *angolensis* is available, I do not see that it can cause any harm to employ it, when only it is understood that by « *H. c. angolensis* » we mean but such specimens of *H. caffer* from Angola as are intermediate between *caffer* and *centralis*.

The subjoined diagram gives a view of the probable phylogeny and interrelations of the five races of *H. caffer*.

Measurements of *Hipposiderus caffer guineensis*.

	San Thomé. 3 adults, 2 skulls.		Prince's Isl. 10 adults, 3 skulls.		Fernando Po. 8 adults, 8 skulls.		Guinean Coast. 20 adults, 16 skulls.	
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.
Skull, total length to front of c	19	19.2	18.7	19	18.5	19.3	18.5	20
» basilar length to front of c	14.7	14.8	14.3	14.7	14.6	15	14.2	15.3
» mastoid width	10	10.2	10	10	10	10.2	10	10.7
» width of brain-case	8.7	8.7	8.6	8.7	8.7	9	8.5	9.1
» zygomatic width	10.3	10.5	10.2	10.7	10.3	11	10.2	11.2
» maxillary width	7	7	7	7.2	7	7.3	7	7.8
» anteorbital width	5.2	5.2	5.2	5.3	5	5.2	5	5.2
» across cingula of canines	4.8	5	4.8	5	4.8	5	4.8	5.2
Mandible, to front of incisors	12.4	12.5	12.2	12.4	12.2	12.9	11.8	13.2
Upper teeth, c-m^3	7	7	6.8	7	6.8	7	6.8	7.3
Lower teeth, c-m_3	7.5	7.7	7.5	7.7	7.5	7.8	7.3	8
Ears, length, inner margin	15	15.7	14.5	16.2			14	15
» greatest breadth	16.2	17	16	17			15.2	17.5
Horseshoe, greatest breadth	6	6.5	6	6.7			6	6.8
Posterior leaf, breadth	6.8	7.1	6.4	7.2			6	7
Forearm	50.5	51.8	50	51.7	48.3	52	48	52.8
Pollex	8.2	9	7.8	8.2			8	9
3rd digit, metacarpal	36	38.5	35.7	38	35.7	38.2	35.2	39.8
— 1st phalanx	17	17.8	17	18.2	16	17.2	16	18.3
— 2nd phalanx	17.8	18.8	17	19	16.8	18.8	15.5	20
4th digit, metacarpal	36	37.5	35	37	34.2	37	34.8	39
— 1st phalanx	12	12.8	11.8	12.8	11	12.2	11	12.7
— 2nd phalanx	9.2	10	9.2	9.8	9	9.8	8.7	10.8
5th digit, metacarpal	32.2	34.2	32	33.7	30.8	33.5	31.2	34.7
— 1st phalanx	13.5	14	13	14.6	12.5	14	12.4	14
— 2nd phalanx	9.8	11.2	10	10.6	9.8	11.2	9.3	11
Tail	33.3	36.7	31	35.5			27.5	33.8
Lower leg	20.8	21	19.8	20.8	19	20.2	18.8	20.5
Foot, with claws	8.8	9.2	8	9			8.7	10

8. **Hipposiderus schneideri**, Thos.

1904. *Hipposideros schneidersi* (misprint), Thomas, Zool. Anz. XXVII. nos. 23-24, pp. 722-23 (12 July 1904). — Type locality: Upper Langkat, Soekaranda, Deli, N. W. Sumatra. (Type examined.)

a–b. ♂ ad., ♀ ad. (in alc.). Soekaranda, Deli, N. W. Sumatra. Collected by Dr. H. Dohrn. Genoa Museum.

H. schneideri differs from its nearest geographical relation, *H. labuanensis*, Tomes (1), in the following particulars: —

(1) In *H. labuanensis* the tip of p_2 (anterior lower premolar) is about level with the middle of the principal cusp of p_1 (posterior lower premolar); in *H. schneideri* p_2 in very much reduced in size, its tip only a little higher than the cingula of the canine and p_1, not, by far, reaching the middle of the cusp of p_4. In *H. labuanensis* the length (antero-posterior extent, labial aspect) of p_2 at base is not much smaller than the length of p_4 at base; in *H. schneideri* the length of p_2 is scarcely half the length of p_4. In *H. labuanensis* p_2 in cross section at base is $\frac{1}{2}$ - $\frac{2}{3}$, in *H. schneideri* $\frac{1}{4}$ - $\frac{1}{3}$, of p_4. In short: p_2 is in *H. schneideri* very much smaller than in *H. labuanensis*, and this is, in fact, the most convenient character for a ready discrimination of the two species.

(2) To the reduction in size of p_2 corresponds a reduction in size of p^2 (anterior upper premolar). In *H. labuanensis* p^2 is small, but easily observable; in *H. schneideri* it is exceedingly small (as a small dot), situated quite on the external side of the maxillary bone, very difficultly observable (scarcely at all without a lens), and occasionally wanting; in the type of the species it is present on one side only, in the two specimens collected by Dohrn on both sides.

(3) The nasal swellings in *H. schneideri* are a trifle broader than in *H. labuanensis:* anteorbital width in the former species 5.8 mm., in the latter 5—5.5 mm.

(1) *H. galeritus*, auct. plurim.; but the type specimen of *H. galeritus* (in the British Museum) seems to me quite a different bat; I therefore, for the present, use the name *H. labuanensis*, Tomes, for the small Bornean species with a frontal sac and two supplementary leaflets. All the small Eastern species of *Hipposiderus* badly need a careful revision.

I fail to see any well marked external difference between the two species (the tail in *H. schneideri* may average a little shorter).

In the subjoined table I give measurements of the type of *H. schneideri* (Brit. Mus. no. 4. 4. 1. 2) and of the two specimens collected by Dohrn.

H. schneideri was hitherto known only from the type specimen in the British Museum.

Measurements of *Hipposiderus schneideri*.

	Sockaranda, Deli, Sumatra.		
	♂ ad. Type.	♂ ad. Genoa Mus.	♀ ad. Genoa Mus.
	mm.	mm.	mm.
Skull, total length to front of c	18.3	18.3	18.9
» basilar length to front of c	14	14.2	14.5
» mastoid width	9.5	9.5	9.8
» width of brain-case	8.7	8.5	8.7
» zygomatic width	10.8	10.5	10.8
» maxillary width	7.2	7.2	7.6
» anteorbital width	5.8	5.8	5.8
» across cingula of canines	4.8	4.7	4.9
Mandible, to front of incisors	12.3	12.2	12.5
Upper teeth, c-m^3	6.6	6.5	6.8
Lower teeth, c-m_3	7	7	7.2
Ears, length, inner margin	14.8	14.5	15
» greatest breadth	14.5	14	14.2
Horseshoe, greatest breadth		6	6.3
Posterior leaf, breadth	6.2	6.2	6.8
Forearm	48.3	48.2	50
Pollex	7	7.5	7.2
3rd digit, metacarpal	33.3	33.8	35
— 1st phalanx	15.4	16.5	16
— 2nd phalanx	14.8	17	17.2
4th digit, metacarpal	33.5	33.2	34.8
— 1st phalanx	11.2	11	11
— 2nd phalanx	8.6	9	8.2
5th digit, metacarpal	29.7	29.7	31
— 1st phalanx	12.2	12	11.8
— 2nd phalanx	9.8	10.2	9.7
Tail	24.5	24.5	23
Lower leg	18.2	18.7	19.3
Foot, with claws	8	8.5	8.2

9. **Rhinolophus truncatus**, Pet.

1871. *Rhinolophus truncatus*, Peters, M. B. Akad. Berlin p. 307 (8 June 1871). — Type locality: Batchian.

1878. *Rhinolophus megaphyllus* (not Gray), var. α, Dobson, Cat. Chir. Brit. Mus. p. 111.

1905. *Rhinolophus truncatus* Pet., Knud Andersen, Proc. Zool. Soc. London II. pp. 80–81, 84, 120 (17 Oct. 1905).

a. ♂ ad. (in alc). Ternate; 1875. Collected by A. A. Bruijn. Genoa Museum.

Rh. truncatus was hitherto known from Batchian only. The Ternate specimen recorded above is in every respect indistinguishable from a series of Batchian examples in the British Museum; also the peculiar coloration of the fur (see my paper, l. s. c.) and the dimensions are practically the same.

All the specimens of *Rh. truncatus* I had hitherto seen were dried skins, collected by A. R. Wallace in Batchian, and all the skulls were more or less fragmentary; I therefore had to describe the nose-leaves from resoftened specimens, to leave out all measurements of the soft parts, and to give only a very incomplete series of measurements of the skull. The Ternate specimen, which is preserved in alcohol and in excellent condition, and the skull of which is perfectly undamaged, enables me to fill up these deficiencies in my description of the species.

As in all primitive eastern forms of the *Rh. simplex* group (of which *Rh. truncatus* is a member), the sella is decidedly broader at base (2.7 mm.) than at summit (1.8 mm.); length (height) of sella, from angle between vertical portion and nasal lobe to summit, 4 mm.; from the base to about one third of its height the lateral margins of the sella are subparallel; here at this point is a very shallow, but distinct, constriction, and then the margins are again subparallel (very slightly converging) to the summit; front face of sella covered with extremely short, whitish hairs, only observable under a lens; summit completely square-cut (« truncatus »). Lancet rather long (4 mm., from posterior transverse bridge), and almost quite cuneate.

In the table below I give, for comparison with the measurements of the Ternate specimen, those of the Batchian examples in the British Museum.

Measurements of *Rhinolophus truncatus*.

	Ternate. ♂ ad.	Batchian. 6 adults, 4 skulls.	
		Min.	Max.
	mm.	mm.	mm.
Skull, total length to front of c	18.8		
» basilar length to front of c	15		
» mastoid width	9		9.2
» width of brain-case	8.2		
» zygomatic width	9.2		
» maxillary width	6.7	6.6	6.8
» across nasal swellings	5.1	5.1	5.1
» across cingula of canines	4.8		
Mandible, to front of incisors	12.8	12.8	13.1
Upper teeth, c-m^3	7.3	7.1	7.3
Lower teeth, c-m_3	7.8	7.8	7.9
Ears, length, inner margin	17.2		
» greatest breadth	14.2		
Nose-leaves, total length	15		
Horseshoe, greatest breadth	9.2		
Forearm	45	44.7	46.8
Pollex	7.8		
3rd digit, metacarpal	32.2	31.2	32.3
— 1st phalanx	12.7	13.2	14
— 2nd phalanx	18.8	18.2	19.1
4th digit, metacarpal	33.3	32	33.5
— 1st phalanx	9.3	9.8	10.6
— 2nd phalanx	11.8	11.2	12.5
5th digit, metacarpal	33	31.7	33.2
— 1st phalanx	10.2	10.7	11.7
— 2nd phalanx	11.8	11.8	11.9
Tail	24		
Lower leg	18.2	18.8	20
Foot, with claws	9		

10. **Rhinolophus stheno**, K. And.

1905. *Rhinolophus stheno*, Knud Andersen, Proc. Zool. Soc. London II. pp. 91-92, 120; pl. III. figs. 8 a, b (17 Oct. 1905).

a, b. ♂ ad., ♀ ad. (in alc.). Soekaranda, Deli, N. W. Sumatra. Collected by Dr. H. Dohrn. Genoa Museum. — Skulls of both specimens examined.

This is the first record of *Rh. stheno* from Sumatra. The species was hitherto known only from the Malay Peninsula (Selangor, Penang).

In the Sumatran specimens, as in all other specimens I have seen, p_3 is external, p_2 and p_4 in contact, p^2 in row.

Rh. stheno is at once distinguished from *Rh. borneensis* and *Rh. rouxi* by the following characters: —

(1) By the very strongly and abruptly projecting nasal swellings; compare the skull of *Rh. stheno* in side view (Proc. Zool. Soc. London 1905 II. pl. III. fig. 8 a) with that of *Rh. borneensis* (ibid. fig. 5 b) and *Rh. rouxi* (ibid. fig. 9 c); in this point *Rh. stheno* is unique among the eastern species of the *Rh. simplex* group.

(2) By some interesting peculiarities in the wing-structure, as shown by the subjoined table of wing-indices: the wing-structure of *Rh. borneensis,* it will be observed, is in all important respects similar to that of *Rh. rouxi*, with the only exception that *Rh. rouxi* has proportionally longer metacarpals; in *Rh. stheno*, however, the following modifications have taken place: — first, the third and fourth metacarpals are somewhat shortened; second, all the proximal phalanges are shortened, *especially the first phalanx of the fourth digit:* in *Rh. borneensis* and *rouxi* this phalanx is much more than, in *Rh. stheno* almost precisely equal to, one fourth the length of the metacarpal; third, the second phalanx of the third digit is noticeably lengthened: in *Rh. borneensis* and *rouxi* it averages decidedly less, in *Rh. stheno* more, than 1 $\frac{1}{2}$ the length of the first phalanx.

(3) By the very short tail: considerably shorter than the lower leg, whereas in *Rh. borneensis* and *rouxi* it is longer than or equal to the lower leg.

Rh. stheno has two rather close relatives in South Africa, viz. *Rh. simulator,* K. And., and *Rh. denti,* Thos.

Wing-indices of *Rhinolophus borneensis, rouxi,* and *stheno.*

	Forearm.	3rd digit.			4th digit.			5th digit.		
		Metac.	1st phal.	2nd phal.	Metac.	1st phal.	2nd phal.	Metac.	1st phal.	2nd phal.
Rh. borneensis. . .	1000	704	299	414	731	213	250	729	227	257
Rh. rouxi.	1000	728	301	426	750	215	258	756	238	248
Rh. stheno	1000	690	278	453	718	182	259	726	207	233

11. **Rhinolophus affinis superans,** K. And.

1905. *Rhinolophus affinis superans,* Knud Andersen, Proc. Zool. Soc. London II. pp. 104, 105 (17 Oct. 1905).

a. ♂ ad. (in alc.). Si Rambé, Sumatra; 1890-91. Collected by Dr. E. Modigliani. Genoa Museum. — Skull extracted. Teeth unworn.

Rh. affinis is readily distinguished from *Rh. rouxi* — a species with which it has almost always been confused — by its pandurate sella (in *Rh. rouxi* the sella is practically parallel-margined), by its more distinctly cuneate lancet (in *Rh. rouxi* the lancet is hastate), by the lengthening of the second phalanx of the third digit (in *Rh. rouxi* less, in *Rh. affinis* more, than 1 $\frac{1}{2}$ the length of the first phalanx), and by the shortening of the palatal bridge.

Rh. ferrum-equinum, which has also a pandurate sella and lengthened second phalanx of the third digit, differs from *Rh. affinis* in having p^2 external to the tooth-row or wanting (in *Rh. affinis* p^2 is situated in the tooth-row), in a peculiar shortening of the third metacarpal, and in the beginning or complete obliteration of the lateral chin grooves.

Rh. affinis is distributed, in various races, from the N. W. Himalayas to S. China, through Indo-China, N. Natunas, and the Malay Peninsula, to Sumatra, Java, and Lombok.

The particular race here under consideration, *Rh. a. superans,* is as yet known from Lower Siam, the Malay Peninsula and Sumatra, and characterised chiefly by the broad horse-shoe and nasal swellings. Both of these peculiarities reach a climax in the still more eastern *Rh. a. princeps,* K. And., from Lombok.

12. **Rhinolophus refulgens,** K. And.

1905. *Rhinolophus refulgens,* Knud Andersen, Proc. Zool. Soc. London II. pp. 124-126, 135, pl. IV. figs. 16 a, b. c (17 Oct. 1905).

a, b. ♂ ad., ♀ ad. (in alc.). Soekaranda, Deli, N. W. Sumatra. Collected by Dr. H. Dohrn. Genoa Museum. — One skull extracted.

This is the first record of *Rh. refulgens* from Sumatra. The species was hitherto known only from two examples, in the British Museum, from the Malay Peninsula (Perak and Selangor).

13. **Rhinolophus acuminatus acuminatus,** Pet.

1871. *Rhinolophus acuminatus*, Peters, M. B. Akad. Berlin (8 June 1871) p. 308. — Type locality: Gadok, Java.
1878. *Rhinolophus acuminatus* Pet., Dobson, Cat. Chir. Brit. Mus. p. 113.
1878. *Rhinolophus petersi* (partim, not Dobson 1872 and 1880), Dobson, Cat. Chir. Brit. Mus. p. 114. — Compare Proc. Zool. Soc. London 1905, II. pp. 95-98.
1905. *Rhinolophus acuminatus*, Pet., *typicus*, Knud Andersen, Proc. Zool. Soc. London 1905, II. p. 133 (17 Oct. 1905).

a. ♂ ad. (in alc.). Buitenzorg, Java. Collected by Dr. Th. Adensamer, 1897. Presented to the British Museum by Marquis G. Doria (no. 6.12.1.13). — Skull extracted. Teeth unworn.

Rh. acuminatus belongs to a small section of the *Rh. lepidus* group, distributed over Sumatra, Nias, Engano, Java, and Lombok, of which now the following forms are known: —

(1) *Rh. sumatranus* K. And. [1]; Sumatra; sella very distinctly expanded below the middle; forearm about 51; third metacarpal about 35.2-36.8; breadth of horse-shoe about 8.2-8.3 mm. — Specimens examined: one adult (with skull) in the British Museum, one adult in the Göttingen Museum.

(2) *Rh. circe* K. And. [2]; Nias; similar to *Rh. sumatranus*, but with rather slenderer skull and smaller teeth; shorter forearm, metacarpals, phalanges, and tibia; forearm 45.2-49; third metacarpal 32-34.2 mm.; breadth of horse-shoe as in *Rh. sumatranus*. — Specimens examined: eight adults (four skulls) in the U. S. National Museum.

[1] Proc. Zool. Soc. London 1905, II. pp. 133-34, 136 (17 Oct. 1905).
[2] Proc. U. S. Nat. Mus. XXIX. no. 1440, pp. 657, 659 (7 March 1906).

(3) *Rh. calypso* K. And. [1]; Engano; similar to *Rh. sumatranus*, but with broader horse-shoe and larger ears; forearm 49-52.8; third metacarpal 35-38.3; breadth of horse-shoe 9.6-10.2 mm. — Specimens examined: two adults (one skull) in the British Museum, six adults (four skulls) in the U. S. National Museum.

(4) *Rh. acuminatus acuminatus* Pet.; Java; allied to *Rh. sumatranus*, but expansion below the middle of the sella rather indistinct or quite obliterated; forearm 48.5-51; third metacarpal 35-36.5 mm.; breadth of horse-shoe as in *Rh. sumatranus*. — Specimens examined: three adults (two skulls) in the British Museum.

(5) *Rh. acuminatus audax* K. And. [2]; Lombok; similar to *Rh. a. acuminatus*, but averaging smaller; forearm 47-49.5; third metacarpal 33.7-35.2; breadth of horse-shoe as in *Rh. a. acuminatus*. — Specimens examined: two adults (one skull) in the British Museum.

The dentition, in all these bats, is very uniform: — p_3 external to the tooth-row (only in one specimen of *Rh. calypso* almost in row); p_2 and p_4 in contact or almost in contact (with the exception just mentioned); p^2 always in row, with a small cusp, pointing inwards.

The five forms, it will easily be seen, are representatives of two « types »; in one (*Rh. sumatranus, circe, calypso*) the sella is very distinctly expanded below the middle; in the other (*Rh. acuminatus*) the expansion of the sella is rather indistinct or quite obliterated. The former type is distributed over Sumatra, Nias, and Engano (western islands), each of these islands having its distinct species; the latter type is known from Java and Lombok (eastern), either of these islands having its separate race.

In the table below I give a summary of the measurements of all the bats examined of this section.

[1] Proc. Zool. Soc. London 1905, II, pp. 134-35, 136, pl. IV, figs. 19 a, b, c (17 Oct. 1 05); Proc. U. S. Nat. Mus. XXIX, no. 1440, pp. 657-59 (7 March 1906).

[2] Proc. Zool. Soc. London 1905, II, p. 133 (17 Oct. 1905).

Measurements of *Rhinolophus acuminatus* and allied forms.

	sumatranus. 2 adults, 1 skull.		*circe*. 8 adults, 4 skulls.		*calypso*. 8 adults, 5 skulls.		*acuminatus*. *acuminat.* 3 adults, 2 skulls.		*acuminatus*. *audax*. 2 adults, 1 skull.	
	Min. mm.	Max. mm.	Min. mm.	Max. mm.	Min. mm.	Max. mm.	Min. mm.	Max. mm.	Min. mm.	Max. mm.
Skull, total length to front of c			20.2	21.7	20.9	23	22			21.2
» basilar length to front of c			16.7	17.5	17	18.2	17.8			16.8
» mastoid width			10	10.2	9.9	10.7	10.5			10
» width of brain-case			8.8	9.1	8.8	9.7	9.4			9.3
» zygomatic width			10.6	11	10.9	11.7	11.4	11.7		11.2
» maxillary width		8.6	7.8	8.2	8.4	8.6	8.7	8.7		8.5
» across nasal swellings		6.2	5.7	6	6.2	6.9	6.2	6.2		6
» across cingula of canines			5.5	5.8	6.2	6.7	6.3	6.7		6
Mandible, to front of incisors		15.8	14.6	15.2	14.8	16	15.7	16		14.8
Upper teeth, c-m^3		8.8	8.1	8.6	8.4	8.9	8.8	8.8		8.2
Lower teeth, c-m_3		9.5	8.8	9.2	9	9.8	9.5	9.6		9
Ears, length, inner margin	18.7	19	16.7	19	19	21.5	18.5	18.8	18	19
— greatest breadth	14.3	14.3	14	15	16	17.2	14	14.5	14	14.5
Nose-leaves, total length	14	16	13	14.6	15	16.8	14		14	14.8
Horse-shoe, greatest breadth	8.2	8.3	8	8.5	9.6	10.2	8.2	8.7	8.4	8.2
Forearm	51	54.2	45.2	49	49	52.8	48.5	51	47	49.5
Pollex	9.1	10	8.8	9.5	9	11	8.7	10	9.5	9.5
3rd digit, metacarpal	35.2	36.8	32	34.2	35	38.3	35	36.5	33.7	35.2
— 1st phalanx	15.2	16.3	13	14.8	13.8	15.8	14.7	16.2	15	15
— 2nd phalanx	20	21	17.5	19.3	18.2	21.5	19.8	20.7	17.5	20
4th digit, metacarpal	37.2	38	32.5	35.8	36	39.3	36	38.7	35.1	38.3
— 1st phalanx	11	11.7	8.7	10.2	9.3	10.8	10	11.8	9.7	10.5
— 2nd phalanx	13	13.6	11	12	12.2	13.8	12	13	12	13
5th digit, metacarpal	37.5	38.3	33	35.8	36.2	39.3	36	38.7	36	38.8
— 1st phalanx	12.2	12.7	10	11.2	10.8	11.8	11.2	12.8	11.5	11.8
— 2nd phalanx	13.7	14.6	11.7	12.8	11.7	14	13.2	13.6	13	13.5
Tail	25.2	26.5	21.5	24	23	26.5	25	25.2	24.7	23.5
Lower leg	22.5	22.5	19.7	22	20.6	23.2	24	23	24	24.7
Foot, with claws	10.8	11	10.2	11.5	10.3	11.5	11	11.8	10.8	11

14. **Rhinolophus macrotis dohrni,** subsp. n.

a, b. Two ♀ ad. (in alc.). Soekaranda, Deli, N. W. Sumatra. Collected by Dr. H. Dohrn. One specimen in the Genoa Museum, the other presented to the British Museum by Marquis G. Doria (no. 6.12.1.22). — Skulls of both specimens extracted. — Types of the subspecies.

Diagnosis — Similar to *Rh. macrotis macrotis*, but with broader horse-shoe.

Details. — In three *Rh. macrotis macrotis*, from Nepal (type locality) and Masuri, the breadth of the horseshoe is 7.5-8.5 mm., in the two *Rh. m. dohrni* 9 and 9.5 mm. The ears in the Sumatran race are apparently somewhat broader than in Himalayan specimens, but in the former specimens they are in a bad state of preservation. The tibia in *Rh. m. dohrni* would seem to be a little shorter. The skull is similar to that of *Rh. m. macrotis,* but a trifle larger, as are also the teeth.

I doubt that that there is in any respect more than an *average* difference between Himalayan and Sumatran individuals of *Rh. macrotis;* I therefore keep the latter distinct as a local race only.

Dentition as in *Rh. m. macrotis:* p_3 in row (in a larger series of skulls p_3 will, no doubt, be found occasionally more or less external in position); p^2 in row, with a comparatively well developed cusp, pointing inwards; a narrow interspace between p^2 and p^4 (reminiscent of p^3, lost in all recent species).

Affinities. — The most conspicuous external peculiarities of *Rh. macrotis* are these: — the long and broad, almost parallel-margined (tongue-shaped) sella; the rather long and dense hairing on the front face of the sella; the low connecting process, starting from a point considerably below the summit of the sella; the long and convex-margined lancet; the large ears. — Some of these characters very strongly recall those of the primitive species of the *Rh. philippinensis* group: the sella of *macrotis* might properly be described as that of a *philippinensis* deprived of its lateral expansions; the shape of the connecting process and lancet, as well as the enlargement of the ears point also towards relationship with *philippinensis.* — The skull is of the general shape characteristic of the most primitive species of *Rhinolophus;* the palatal bridge rather longer than usual. The dentition is quite primitive: p_3 often situated in the tooth-row, or, if external, it has a tendency towards the row, or there is, at least, a distinct interspace between p_2 and p_4, reminiscent of the former position of p_3 in the row; p^2 with a comparatively well developed cusp and always situated in the tooth-row; the upper canine and p^1 widely separated. — In short: *Rh. macrotis* is a type on a low level of evolution, which has no closer relative, among living species, than the primitive forms of the *Rh. philippinensis* group.

Rh. macrotis was hitherto only known from the Himalayas (Masuri, Nepal). It is therefore of much interest now to see the range of this species extended to Sumatra. After this there can, of course, be no doubt that it will also be found in Indo China and the Malay Peninsula.

A second species of the *macrotis* type, *Rh. hirsutus*, K. And., differing by its still larger ears, longer tail, and slightly heavier skull, inhabits the Philippine Islands.

At a period when the passage for Mammals from Southern Asia to Africa, owing to different physiographic conditions, was much easier than now, the *Rh. macrotis* type spread into the Ethiopian region. There it is now represented by four species: *Rh. aethiops*, *fumigatus*, *hildebrandti*, *eloquens* (see below, under *Rh. fumigatus*). Thus the whole area inhabited by this type of bat extends from the Philippines and Sumatra in the east, to Angola and Senegambia in the west.

Note on the Rhinolophi of Sumatra. — In December 1905, when writing a geographical review of the species and subspecies of *Rhinolophus* (1), the following forms were known to me from Sumatra: *Rh. affinis superans*, *Rh. sumatranus*, *Rh. trifoliatus trifoliatus*. Dr. Dohrn's collections have added three species to this list, viz. *Rh. stheno*, *Rh. refulgens*, and *Rh. macrotis dohrni*. Of the six forms now on record from Sumatra, four (*Rh. stheno*, *Rh. affinis superans*, *Rh. refulgens*, *Rh. trifoliatus trifoliatus*) are common to this island and the Malay Peninsula; a fifth species (*Rh. macrotis*), as being known from the Himalayas and Sumatra, will no doubt also be found in the Malay Peninsula; the sixth (*Rh. sumatranus*) is as yet only recorded from Sumatra, but may, not improbably, also occur on the adjacent continent. All this is evidence of the extremely close connection between the *Rhinolophus* fauna of Sumatra and that of the Malay Peninsula.

The *Rhinolophi* inhabiting the chain of islands running parallel to the south coast of Sumatra are still very imperfectly known; but so far as the evidence goes they seem to be more peculiar. Of the two forms I have examined from Nias, the one (*Rh. circe*) is allied to *Rh. sumatranus*, but apparently suffi-

(1) Ann. & Mag. N. H. (7) XVI. p. 656 (1 Dec. 1905).

ciently differentiated to be regarded a distinct species; the other is an indigenous race *(Rh. trifoliatus niasensis)* of a species otherwise inhabiting Sumatra, Borneo, the Malay Peninsula, Lower Siam, and Tenasserim. The only form known from Engano *(Rh. calypso)* is allied to *Rh. sumatranus*, but a distinct species.

Still more imperfect is our knowledge of the *Rhinolophi* inhabiting the northern continuation of the Mentawei chain, viz. the Nicobars and Andamans. Only two forms (altogether three specimens!) have been recorded: « *Rh. andamanensis* », a bat of the *Rh. affinis* type, probably rather near to *Rh. affinis superans* from the Malay Peninsula and Sumatra; and *Rh. cognatus*, which is also allied to a species *(Rh. refulgens)* occuring in the Malay Peninsula and Sumatra.

Measurements of *Rhinolophus macrotis dohrni* and *macrotis*.

	Rh. m. dohrni. Sumatra. 2 adults, 2 skulls. Types.		*Rh. m. macrotis.* Himalaya. 3 adults, 1 skull.	
	Min.	Max.	Min.	Max.
	mm.	mm.	mm.	mm.
Skull, total length to front of c	18	18.2		17.5
» basilar length to front of c	14.2	14.4		13.8
» mastoid width	8.8	8.8		8.8
» width of brain case	7.6	7.7		7.8
» zygomatic width	8.2	8.2		8.2
» maxillary width	5.8	6		5.8
» across nasal swellings	4.9	5		4.7
» across cingula of canines	4	4		3.7
Mandible, to front of incisors	11.8	11.8		11.5
Upper teeth, c-m^3	6.7	6.7		6.3
Lower teeth, c-m_3	7	7		6.8
Ears, length, inner margin	21.7	22	19	21
— greatest breadth	19	19	15.5	16.5
Nose-leaves, total length	14.7			
Horseshoe, greatest breadth	9	9.5	7.5	8.5
Forearm	42.7	41	41	43
Pollex	5.7	6		
3rd digit, metacarpal	29.8	30	30.7	31.2
— 1st phalanx	12	12.8	13.2	13.7
— 2nd phalanx	15	15	15.8	16
4th digit, metacarpal	31	31.3	32.2	32.2
— 1st phalanx	8.5	9	8.9	9.3
— 2nd phalanx	9.5	10	10.5	11
5th digit, metacarpal	31	31	31.7	32.8
— 1st phalanx	10	10.2	10.2	11
— 2nd phalanx	10	10	10.8	10.8
Tail	18	18.7	17	18.5
Lower leg	16.2	17	17.8	18.8
Foot, with claws	8.2	8.8	8.2	9.2

15. **Rhinolophus fumigatus fumigatus**, Rüpp.

1842. *Rhinolophus fumigatus*, Rüppell, Mus. Senck. III. pp. 132, 155. — Type locality: Shoa. (Types examined.) Frankfurt Museum.
1877. *Rhinolophus macrocephalus*, Heuglin, Reise in Nordost-Afrika II. pp. 22-23. — Type locality: Adowa, Abyssinia. (Type examined.) Stuttgart Museum.
1878. *Rhinolophus ferrum-equinum* (partim, not Schreb.), Dobson, Cat. Chir. Brit. Mus. p. 119.
1885. *Rhinolophus antinorii*, Dobson, Ann. Mus. Civ. Genova (2) II. pp. 16-17. — Type locality: « Daimbi, Shoa ». Genoa Museum.
1904. *Rhinolophus fumigatus*, Rüpp., Knud Andersen, Ann. & Mag. N. H. (7) XIV. pp. 451-53 (1 Dec. 1904.) — *Rh. macrocephalus* and *antinorii* shown to be synonyms of *Rh. fumigatus*.
1905. *Rhinolophus aethiops* (not Peters), Senna, Archivio Zoologico (Napoli) II. pt. 3, pp. 267-71; pl. XVIII. figs. 28-39. — Erythrea.

a. ♀ ad. (in alc.) Asmara, Erythrea; Oct. 1892. Collected by Dr. V. Ragazzi. Genoa Museum. — Skull extracted.

Rh. fumigatus belongs to a small group of Ethiopian species, allied to *Rh. macrotis*, Hodgs. (Himalayas to Sumatra), and *Rh. hirsutus*, K. And. (Philippines), but on a much higher level of evolution than the Oriental species; in these latter p_3 is always present, p^2 always comparatively well developed and always situated in the tooth-row, and the wing-structure is quite primitive; in the Ethiopian species p_3 and p^2 are rudimentary, pushed out to the external side of the tooth-row, or completely lost, and the wing-structure is modified.

The Ethiopian representatives of this group are these four: — (1) *Rh. aethiops*, Pet., known from Damaraland and Angola, and characterised (as compared with *Rh. fumigatus*, the only species with which it can be confused) by having, as a rule, a rudimentary p_3 and p^2; further by its rather broader cranial rostrum, broader horse-shoe, and slightly longer tail. — (2) *Rh. fumigatus fumigatus*, Rüpp., from Somaliland, Abyssinia, and Erythrea, characterised by having, as a rule, completely lost p_3 and p^2; further by its rather narrower cranial rostrum, narrower horse-shoe, and slightly shorter tail. In British East Africa this form is replaced by the smaller *Rh. fumigatus exsul*, K. And. It is of some importance to notice that the small p^2 is not

always wanting in *Rh. fumigatus;* I have had the opportunity of examining eight specimens of the typical form; in one (a youngish individual, cotype of *Rh. macrocephalus)* an exceedingly minute p^2 is present on both sides, situated quite on the external aspect of the maxillary bone; the same is the case in the Asmara specimen (adult, teeth almost unworn) sent from the Genoa Museum; in Senna's figure of an Erythrea skull (l. s. c. figs. 36 and 37) I find not only a p^2 but even a p_3; this is the only instance known to me of the presence of a rudimentary p_3 in *Rh. fumigatus.* — (3) *Rh. hildebrandti*, Pet., from Mazoe to Kenya, at once distinguished by its very large size; p_3 is only occasionally wanting, p^2 as a rule present. — (4) *Rh. eloquens,* K. And., apparently confined to Uganda, in size intermediate between *Rh. fumigatus* and *hildebrandti,* with p_3 almost always completely lost, and p^2 still more reduced in size than in *hildebrandti.*

Rh. ferrum-equinum is of practically the same size as *Rh. fumigatus;* p_3 is very often, p^2 not rarely lost, and whenever these small premolars are present, they are external; in so far there is some resemblance between the two species, and this is, no doubt, the reason why Peters regarded them as very closely related (1), and Dobson (in 1878, l. s. c.) even as inseparable. But they are in many respects fundamentally different: — The skull of *fumigatus* (and allied Ethiopian species) is at once distinguished by its very high and abruptly projecting nasal swellings and stronger sagittal crest; as a consequence of these two peculiarities the postnasal depression (between the nasal swellings and the front of the sagittal crest) is much deeper than in *ferrum-equinum;* the cranial rostrum is somewhat narrower, the occipital portion of the skull slenderer; the ears broader scarcely attenuated below the tip, the tip itself blunter; the sella considerably broader, less pandurate, and its front face densely covered with rather long hairs; the posterior connecting process lower and more rounded off; the indices of the third, fourth, and fifth metacarpal are, respectively, 692, 726, and 742, whereas in *ferrum-equinum* they are 644, 724, and 743, i. e. the peculiar shortening of the third metacarpal in *ferrum-equinum* is not

(1) MB. Akad. Berlin 1871, p. 311.

found in *fumigatus;* the proximal phalanges of the digits are comparatively shorter; the tail much shorter. The similarity in dentition is simply due to the fact that both species are on a very high level of evolution, but *ferrum-equinum* is an Oriental-Palaearctic offshoot of the *Rh. simplex* group, *fumigatus* an Ethiopian representative of the *Rh. macrotis* group, the similarity in dentition, therefore, an instance of convergence, not indicative of true relationship.

16. **Rhinolophus euryotis aruensis,** subsp. n.

a. ♀ ad. (in alc.). Aru Islands. Collected by V. Rosenberg. Received from Dr. Jentink. Genoa Museum. Type of the subspecies.

The smallest race of *Rh. euryotis.*

Rh. e. aruensis comes very near to *Rh. e. timidus,* from Batchian, but the skull is a trifle smaller and slenderer, the mandible shorter; the teeth will probably prove to average smaller. Also externally *Rh. e. aruensis* is very similar to the Batchian race; this latter, as compared with *Rh. e. euryotis* and *præstans,* is chiefly characterised externally by its narrow horse-shoe and rather small ears; in both respects *Rh. e. aruensis* accords with *Rh. e. timidus*, but the forearm, the pollex, the phalanges of the third, fourth and fifth digits, and the foot are smaller. For details see the table of measurements p. 36.

A year ago (1), when working out the series of *Rh. euryotis* in the collection of the British Museum, I distinguished three races, viz. — *Rh. e. timidus,* from Batchian, characterised chiefly by the narrower horse-shoe and rather slenderer skull; *Rh. e. euryotis,* from Amboina, with broad horse-shoe and rather more heavily built skull; and *Rh. e. præstans,* from the Key Islands, which marks the extreme in the size of the horse-shoe and the width of the skull and nasal swellings. From this it will be observed that, passing from Batchian in the north, through Amboina, to the Key Islands in the south, there is an increase in the size of the horse-shoe and skull, and it might therefore be

(1) Ann. & Mag. N. H. (7) XVI. pp. 285-87: Sept. 1905.

expected that the Aru representative of this type of bat would either be identical with its nearest geographical neighbour, *Rh. e. præstans*, or perhaps exhibit the peculiarities characteristic of this latter race in a still more exaggerated degree. The true fact, as shown above, is quite different: *Rh. e. aruensis* is much more similar to the Batchian than to the Key Island race, so that beginning with *Rh. e. præstans* there is a « falling off » in the size of the horse-shoe and skull both northwards, through Amboina to Batchian, and eastwards to the Aru Islands. Thus the races occupying the periphery of the known area of *Rh. euryotis* are more alike than the geographical neighbours, *Rh. e. præstans* and *aruensis*.

Measurements of *Rhinolophus euryotis*.

	timidus. 3 adults, 3 skulls.		*euryotis*. ♂ ad.	*praestans*. ♂ ad. Type.	*aruensis*. ♀ ad. Type.
	Min. mm.	Max. mm.	mm.	mm.	mm.
Skull, total length to front of c.			25.1	25.4	23.6
» basilar length to front of c			20.5	20.8	18.8
» mastoid width			11.7	12	11.1
» width of brain-case	10.4	10.4	10.8	11.1	10.2
» zygomatic width	11.8	12.2	12.2	12.8	11.7
» maxillary width	8.9	9	8.7	9.8	8.8
» across nasal swellings	6.8	6.9	6.8	7.2	6.7
» across cingula of canines	6.5	6.7	6.2	7.2	6.5
Mandible, to front of incisors	17.1	17.5	18	18	16.3
Upper teeth, c-m^3	9.7	9.7	10.2	10.2	9.5
Lower teeth, c-m_3	10.3	10.5	11	11	10
Ears, length, inner margin	20.5		22.8	23	21.8
» greatest breadth	17		19	18	18.2
Nose-leaves, total length	17		17.5	19	
Horse-shoe, greatest breadth	10.2	10.7	11.8	13	10.7
Forearm	55	57.2	56.8	58	53.6
Pollex	11.3		11	12.2	9.8
3rd digit, metacarpal	38.2	40.2	40.3	40.8	39.5
— 1st phalanx	16.2	16.8	17.2	17.2	14.8
— 2nd phalanx	24	25.2	24	25	23
4th digit, metacarpal	38.8	41.2	41	42.5	40.2
— 1st phalanx	10.8	11	11.7	11.2	9.8
— 2nd phalanx	13.8	16	14.8	16	13.2
5th digit, metacarpal	40.3	41.7	41.5	43.2	40
— 1st phalanx	12.2	13.4	13.1	12.8	11.5
— 2nd phalanx	13.8		13	13.7	11.8
Tail	18.5		20	21.5	18
Lower leg	25.7	27.8	28	28	25.5
Foot, with claws	13.2		13.2	13	11.5

17. **Myotis dryas**, sp. n.

a, b. ♂ ad., ♀ ad. Port Blair, S. Andaman; August 1891. Received from Prof. E. H. Giglioli, Genoa Museum. — Cotypes of the species; the one in the Genoa Museum, the other presented by Marquis G. Doria to the British Museum (no. 6.12.1.31).

Diagnosis. — Apparently allied to *Myotis adversus* Horsf., but cranial rostrum lower, p^3 (middle upper premolar) in row, outer margin of ear-conch more deeply and abruptly emarginated above, and foot markedly smaller. Forearm (two specimens, the types) 38.5-39.8 mm.

Skull. — Of the skull of the type specimen of Horsfield's *M. adversus*, from Java (a skin in alcohol, Brit. Mus. no. 79. 11. 21. 123) only the front half, with the tooth-rows complete, has been preserved, and no other examples of this species from Java are available for comparison. Judging from this skull fragment, the skulls of *M. adversus* and *dryas* are probably very nearly of equal size, but the rostrum of *M. dryas* is considerably lower, both in front and, especially, posteriorly, and the bony palate is a little narrower; height of rostrum from alveolar border level of front of m^1, in *M. adversus* 3.8 mm., in *M. dryas* about 3 mm.; maxillary width, externally, across antero-external corners of m^3-m^3, in *M. adversus* 6.8 mm., in *M. dryas* 6.1-6.3 mm.

Teeth. — In *M. dryas* the cusps of the bifid inner upper incisor are almost of equal length (vertical extent), in *M. adversus* the outer is decidedly shorter than the inner cusp; in the skulls of both specimens these teeth are practically unworn. In *M. dryas* p^3 (middle upper premolar) is situated in the tooth-row, with but a very slight tendency towards the lingual side, p^2 and p^4 therefore quite separated, and p^3 distinctly visible from without; p^3 in cross section at base (coronal aspect) equal to, or a little more than, half the area of p^2; in *M. adversus* p^3 is situated completely internal to the tooth-row, not visible from without, p^2 and p^4 in contact, and p^3 in cross section at base equal to about $\frac{1}{3}$ of p^2. Also p_3 is in *M. dryas* less reduced in size; in cross

section at base equal to about $\frac{2}{3}$ of p_2, in *M. adversus* scarcely $\frac{1}{2}$ of p_2; in both species p_3 is completely in row.

Ear. — Outer margin of ear-conch in *M. dryas* considerably more deeply and abruptly emarginated above, than in *M. adversus*, the upper half of the conch therefore narrower; tip rounded. Ears not quite reaching the tip of the muzzle when laid forwards.

Tragus straight, attaining its greatest width far below the middle of the inner margin, tip narrow and subacutely pointed; inner margin practically straight from base to tip; outer margin above the basal notch (the deep notch opposite the base of the inner margin) in its lower two thirds convex, in its upper third flatly concave; the whole of the outer margin very finely serrate; the tip of the tragus does not quite reach the middle of the inner margin of the ear-conch.

Foot. — Markedly smaller than in *M. adversus:* length 9.8-10 mm., against 11.8 in the Java species.

General size. — Externally *M. dryas* is apparently a trifle smaller than *M. adversus:* forearm (two specimens, the types) 38.5-39.8 mm., as against 41.5 in the type of *M. adversus*. The difference in the length of the tooth-rows is infinitesimal: upper teeth, c-m^3, 5.9-6 mm. in *M. dryas*, 6.3 mm. in *M. adversus*.

Other external characters. — Calcar very long, bordering $^5/_7$ of the distance from foot to tail vertebræ. Posterior margin of interfemoral, between tip of calcar and tail, fringed with hairs. Last tail vertebra projecting beyond membrane. Wings from base (one specimen) or middle (the other) of metatarsus.

Affinities. — The general characters of *M. dryas* assigns it a place in the « subgenus » *Leuconoë* as defined by Dobson in his Catalogue (p. 285): calcar very long, interfemoral forming a very acute angle in the centre of its free margin behind, tail projecting by the last vertebra from the membrane; foot rather strong, though proportionally less so than in the majority of species placed by Dobson in this section. Its nearest known ally seems to be the species with which I have compared it here, *M. adversus*.

Remark. — This is the first record of a species of *Myotis* from the Andamans. The occurrence of the genus in these islands was, of course, to be expected.

Measurements of *Myotis dryas* and *adversus*.

	M. dryas. Types. ♂ ad.	*M. dryas*. Types. ♀ ad.	*M. adversus*. Type. Ad.
	mm.	mm.	mm.
Skull, total length to front of inc.	15.5	15.8	
» basilar length to front of inc.	13	13.1	
» mastoid width	8	8.1	
» width of brain-case	7.5	7.6	
» zygomatic width	9.6		
» maxillary width	6.1	6.3	6.8
» interorbital constriction	3.8	3.8	
» anteorbital width	5.2	5.2	
Mandible, to front of incisors	11.5	11.3	12
Upper teeth, c-m^3	5.9	6	6.3
Lower teeth, c m_3	6.4	6.4	6.8
Ears, length, inner margin	13.3	13.2	
» length, outer margin	16	16	
» width	10	10.5	
Tragus, length, inner margin	5.7	5.6	
Forearm	38.5	39.8	41.5
Pollex	8	8.5	
2nd metacarpal	34	36	
3rd digit, metacarpal	35.5	36.8	37.8
— 1st phalanx	16.2	16.8	14.2
— 2nd phalanx	13.6	15.5	
4th digit, metacarpal	34	35.2	36
— 1st phalanx	14	14.7	10.2
— 2nd phalanx	8.2	10	
5th digit, metacarpal	33.5	34	34.8
— 1st phalanx	9.2	10	9
— 2nd phalanx	6.7	7.2	
Tail	39	38	
Lower leg	16.8	17.7	
Foot, with claws	10	9.8	11.8
Calcar	15.8	17.5	15+
Tip of calcar to tail	5	6	

18. **Chaerephon johorensis**, Dobs.

1873. *Molossus (Nyctinomus) Johorensis*, Dobson, Proc. Asiat. Soc. Bengal, Jan. 1873, pp. 22–23.

1874. *Nyctinomus (Chaerephon) Johorensis*, Dobs., Dobson, Journ. Asiat. Soc. Bengal, XLIII. pt. II. no. 2, p. 144 (17 Oct. 1874).

1876. *Nyctinomus johorensis*, Dobs., Dobson, Mon. Asiat. Chir. pp. 183–84, text-fig. (head in upper view), pp. 202-3.

1877. *Nyctinomus johorensis*, Dobs., Dobson, Proc. Zool. Soc. London 1876, pp. 726–28, text-fig. 5 (copied from Mon. Asiat. Chir., l. s. c.).

1878. *Nyctinomus johorensis*, Dobs., Dobson, Cat. Chir. Brit. Mus. p. 432.

a. ♂ ad. (in alc.). Soekaranda, Deli, N. W. Sumatra. Collected by Dr. H. Dohern. Genoa Museum.

The type, in the Calcutta Museum, of this very remarkable species is from Johore, Malay Peninsula. The individual obtained by Dr. Dohrn is of much interest as being only the second specimen on record, and as showing the range of the species to extend to Sumatra.

The skull and dentition of *Ch. johorensis* were hitherto undescribed, the affinities of the species therefore not quite clear.

Skull. — So similar, in general shape and even in size, to that of *Ch. plicatus,* Buch. Ham. (1), as to differ only in points of very subordinate importance: — the upper aspect of the rostrum is decidedly flatter, in *plicatus* markedly convex; the sagittal and lambdoid crests less prominent, and the former not produced so far forwards (individuals of the same age, of *johorensis* and *plicatus,* have been compared); the facial foramen, which is situated directly in front of the anterior point of the sagittal crest, is, owing to the shortness of this crest in *johorensis,* more backwards in position than in *plicatus;* the anterior nares are not directed so much upwards as in *plicatus;* the palate is slightly narrower (as, on the whole, the skull is perhaps a trifle slenderer). The premaxillary region as in *plicatus* (no inter-premaxillary space; incisive foramina small and rounded; &c.).

Teeth. — Number and general characters of the teeth as in *Ch. plicatus:* $\frac{2}{4}$ incisors, $\frac{4-5}{2}$ premolars. Upper incisors considerably shorter (vertical extent), and stouter at base, than in *plicatus,* but otherwise not differing; upper canines shorter; anterior upper premolar smaller; the principal cusp (cusp 5) of posterior upper premolar shorter (not so much projecting beyond the level of the molar cusps); molars quite as in *plicatus.* Lower incisors as in *plicatus* (lateral much slenderer than median pair); lower canines shorter (compare upper canines); anterior lower premolar lower and markedly smaller than in *plicatus:* cross section at base in *johorensis* rather smaller, in *plicatus* larger, than that of posterior premolar. — All these details, it will easily be seen, indicate only a small difference in the relative size of the front teeth, and can be summarised in these few words: the upper incisors, upper and lower canines, upper premolars, and

(1) The skull of *Ch. plicatus* with which I have compared that of *Ch. johorensis* is of a Java specimen (♂ ad., teeth unworn), Brit. Mus. no. 46. 4. 21. 21.

anterior lower premolar are in *johorensis* comparatively shorter or smaller than in *plicatus*.

Frontal box. — A subtriangular groove between the ears, about 5 mm. broad and 5 mm. long. A deep transverse band connecting the anterior margins of the ears, in front of the groove; the upper border of this band is subtriangularly raised in the middle; this median, triangularly projecting portion of the band is convex on the front aspect, hollow on the posterior aspect, and fits like a lid to the groove; tufts of long hairs in the front part of the bottom of the groove, and on the posterior aspect of the lid near its base. The animal can fold the upper half of the ear-conch downwards; in doing so, the connecting band (and consequently the lid) is drawn forwards, disclosing the groove; in the erect position of the ears, the groove is covered by the lid. — This frontal box in certain respects recalls a frontal apparatus recently described by me in the Phyllostome genus *Micronycteris* (1), but is more complicated in structure. Its function is, no doubt, the same as that of the frontal sac in many species of *Hipposiderus;* this sac has no « lid », but its « lips » can be opened or closed ad libitum, and the bottom of the sac is, like the groove in *Ch. johorensis,* furnished with a tuft of long hairs, projecting through the aperture of the sac. — It should be remembered that the specimen of *Ch. johorensis* obtained by Dohrn is a male, as is also the type in Calcutta. Females of this species being as yet unknown, it remains uncertain, whether they possess a frontal box, or, if so, whether it is of the same size and structure as in the males.

Affinities. — *Ch. johorensis* is closely related to *Ch. plicatus, Ch. jobensis,* and allied species. The only essential difference in the skull is the more flattened rostrum in *johorensis*, a peculiarity which is probably a consequence of the development of a complicated frontal apparatus in this species. The dentition is in all important respects the same. Apart from the frontal apparatus, there are scarcely more than two external points worth mentioning: the tragus is a little broader in *johorensis* than in *plicatus*, but hardly more so than in *jobensis;* the fifth metacarpal would seem to be proportionately somewhat longer in

(1) Ann. & Mag. N. H. (7) XVII. p. 52; July 1906.

johorensis, its index being 596, as against 543 in *plicatus* and *jobensis*. In short, the only striking differences between *Ch. johorensis* and *Ch. plicatus* (and allies) is: the development of a very remarkable frontal box, and the flatter cranial rostrum resulting therefrom.

19. **Mormopterus doriae**, sp. n.

a. ♂ ad. (in alc.). Soekaranda, Deli, N. W. Sumatra. Collected by Dr. H. Dohrn. Genoa Museum. — Type of the species.

Diagnosis. — A small « *Nyctinomus* » (sensu lato, as in Dobson's Catalogue), with $\frac{2}{6}$ incisors, $\frac{1}{2}$ premolars, and very strong supraorbital crista; with large gular sac, the front margin of the ears quite straight, the fifth metacarpal equal to about $^2/_3$ the length of the third; and inhabiting Sumatra. — Forearm 38 mm.

Details and Remarks. — *The new Sumatran species of* Mormopterus *to be described here belongs to a small section of the genus which till now was known only from the Mascarenes, Madagascar, and Port Natal.* This section, characterised by the species having $\frac{2}{6}$ incisors, $\frac{1}{2}$ premolars, and a gular sac, numbered hitherto two species, *M. acetabulosus* Comm. (Mascarenes, Madagascar, Port Natal) and *M. jugularis* Pet. (synonym: *Nyctinomus albiventer* Dobs.; Madagascar) (1). *M. acetabulosus* has a distinct emargination in the front margin of the ear-conch, below the tip (see figure in M. B. Akad. Berlin 1881, plate, fig. 1), whereas in *M. jugularis* the front margin of the ear is straight (l. c. fig. 2). *M. doriae* is in this as in most other respects similar to *M. jugularis*, and on a comparison with this latter species the subjoined description is based: —

M. doriae accords with *M. jugularis*, — in the general shape of the skull; in the number and structure of the teeth; in the presence of a gular sac; in having the front margin of the ears quite straight; in short: in all the more important cranial, dental and external characters, even in the general size.

(1) *M. norfolcensis* Gray has $\frac{2}{4}$ incisors, not $\frac{2}{6}$ as stated by Dobson (Catalogue p. 439); it belongs to a wide-spread section of the genus characterised by the species having $\frac{2}{4}$ incisors and $\frac{2}{2}$ premolars.

It differs from *M. jugularis* in the following particulars: — The lower aspect of the basis cranii (basioccipital in front, basisphenoideum, presphenoideum) is distinctly keeled along the median line; in *jugularis* plain; the brain-case and rostrum are proportionally broader, the greater width of the latter being chiefly due to the more strongly developed and more prominent supraorbital crests; the inter-premaxillary space is rather wider. The upper canines, though of the same vertical extent as in *jugularis*, are somewhat heavier at base; the anterior lower premolar is larger: rather more than $^2/_3$ the height, in *jugularis* about half the height, of the posterior premolar. The gular sac is enormously developed, 7.5 mm. wide in front, and 6 mm. deep (thus proportionally still larger than in *acetabulosus*); in *jugularis* it is very small: width in front about 3 mm., depth about 1.5 mm. The front margins of the ears touch each other in the middle line (in so far the ears are inter-connected); in *jugularis* the margins are distinctly separated. The lower leg is somewhat longer: 12.5 mm., as against 10.5-11 mm. in *jugularis*.

The colour of the single specimen is unsuitable for description, the whole that can be safely said being that the fur is dark on the upperside (apparently with lighter basis), greyish beneath.

In the table below I give measurements of the type of *M. doriae* and, for comparison, of a male and female of *M. jugularis* (Brit. Mus. nos. 82. 3. 1. 31-32).

M. doriae needs no closer comparison with *M. acetabulosus*, which has some cranial and dental characters of its own, has (as said above) the front margin of the ear-conch distinctly emarginated below the tip, and is a markedly smaller species. The only respect in which it closely approximates the Sumatran species is the strong development of the gular sac.

The interest of *M. doriae* is not only that it is an Indo-Malayan representative of a *group* hitherto known from Madagascar and S. E. Africa only; it lies still more in the fact that it is, as shown by the brief description above, so closely related to a Malagasy *species* as to differ only in trivial details.

I have named this bat in honour of the Marquis Giacomo Doria, who has always so generously placed his intimate knowledge of Chiroptera and the rich collections of the Museum under his charge at the service of specialists.

Measurements of *Chaerephon johorensis*, and *Mormopterus doriae* and *jugularis*.

	Chaerephon johorensis.	Mormopterus doriae.	Mormopterus jugularis.	
	Sumatra. ♂ ad.	Sumatra. ♂ ad. Type.	Betsileo, ♂ ad.	Madag. ♀ ad.
	mm.	mm.	mm.	mm.
Skull, total length to front of inc.	20.5	17.2	17	
» basilar length to front of inc.	16.6	15.1	14.6	
» mastoid width	10.8	10.1	9.8	
» width of brain-case	9.7	8.7	8.3	
» zygomatic width	11.8			
» maxillary width	8.5	7.2	7.2	
» across tips of anteorb. prc.	6.8	7.5	6.8	
» across cingula of canines	5	5	4.8	
Mandible, to front of incisors	13.8	12.5	12.2	
Upper teeth, c-m^3	7.2	6.5	6.2	
Lower teeth, c-m_3	7.8	6.9	6.7	
Ears, length, anter. margin	21	15.2		
— greatest breadth		14.8	14.8	14.3
Forearm	47	38	38.2	36.3
Pollex	11	8.5	8	7.5
3rd digit, metacarpal.	44	37.2	36	34
— 1st phalanx	19.8	14.3	14.3	13
— 2nd phalanx	18.8	11.8	12	11
4th digit, metacarpal.	43.5	35	34.8	32
— 1st phalanx	15.8	12.2	12	11.5
— 2nd phalanx	11.7	8.2	8.8	7.8
5th digit, metacarpal	28	23.2	22	21.8
— 1st phalanx	11.6	9	9.2	8.2
— 2nd phalanx	4.5	4.2	4	4
Tail	41.7	30	34	33.8
Lower leg	16.2	12.5	11	10.5
Foot, with claws	12.8	9.8	9	8.8

Index of technical names.

acuminatus (Rhinolophus) pp. 27-29.
adversus (Myotis) pp. 37-39.
aethiops (Rhinolophus) p. 33.
affinis (Rhinolophus) p. 26.
albiventer (Mormopterus) p. 42.
angolensis (Hipposiderus) pp. 19, 20.
antinorii (Rhinolophus) p. 33.
aruensis (Rhinolophus) p. 35.
audax (Rhinolophus) pp. 28-29.
bicornis (Hipposiderus) p. 12.
borneensis (Rhinolophus) p. 25.
caffer (Hipposiderus) pp. 11, 16, 18-20.
calypso (Rhinolophus) pp. 28-29.
centralis (Hipposiderus) pp. 17, 18-20.
circe (Rhinolophus) pp. 27-29.
dobrni (Rhinolophus) p. 29.
doriae (Mormopterus) p. 42.
dryas (Myotis) p. 37.
eloquens (Rhinolophus) p. 34.
enganus (Hipposiderus) pp. 8, 9.
eurygotis (Rhinolophus) pp. 35-36.
exsul (Rhinolophus) p. 33.
ferrum-equinum (Rhinolophus) pp. 26, 34.
fumigatus (Rhinolophus) p. 33.
gracilis (Hipposiderus) p. 12.
guineensis (Hipposiderus) pp. 17, 18-20.

hildebrandti (Rhinolophus) p. 34.
johorensis (Chaerephon) pp. 39-42, 44.
jugularis (Mormopterus) pp. 42-44.
lankadiva (Hipposiderus) p. 9.
macrocephalus (Rhinolophus) p. 33.
macrotis (Rhinolophus) pp. 30-32.
masoni (Hipposiderus) pp. 6, 9.
petersi (Rhinolophus) p. 27.
praestans (Rhinolophus) pp. 35-36.
refulgens (Rhinolophus) p. 26.
rouxi (Rhinolophus) p. 25.
schnideri (Hipposiderus) p. 21.
stheno (Rhinolophus) p. 24.
sumatranus (Rhinolophus) pp. 27-29.
superans (Rhinolophus) p. 26.
tephrus (Hipposiderus) pp. 12-16, 18-20.
timidus (Rhinolophus) pp. 35-36.
truncatus (Rhinolophus) p. 23.